REMARKS

"Claims 1-4, 6, 11, 13-17, 19, 24, 26-32, 34,40, 41,42, 48, and 50 are rejected under 35 USC 102(e) on the basis of being anticipated by Spangler (US 6124592). Spangler discloses a pulsed, atmospheric pressure plasma apparatus for generating and analyzing light emission [emphasis added] characteristics of species in the plasma, which comprises in combination (Fig.39): an electrically insulating hollow tube (Fig.3), a grounded metallic electrode (lower electrode of parallel plate capacitor), a second metallic electrode (upper electrode of parallel plate capacitor), means for flowing gas in which the species is entrapped through said hollow tube (drift gas with sample), a high voltage dc pulse generator (104), and an optical spectrometer (103) [emphasis added]."

The Applicant respectfully traverses this rejection. Spangler does not teach the same apparatus as disclosed in the presently claimed invention where: Claims 1 and 41 disclose "an optical spectrometer" ; Claim 14 discloses a "means for spectrally resolving and detecting light emission"; and Claim 29 discloses "spectrally resolving and detecting light emission".

A mass spectrometer [emphasis added], as disclosed in Spangler, uses a Faraday plate to detect the mobile ions and send a signal of the ion strength as indicated by a collected charge pulse height. The ion trap provides a method to differentiate between mobile ions through a technique designed to separate the time at which the ions are detected at the Faraday plate, thereby improving the mass spectrometers efficiency.

Mass spectrometers are not optical spectrometers. As presented in The McGraw-Hill Dictionary of Scientific and Technical Terms, 6th Edition, a mass spectrometer is "a mass spectroscope in which a slit moves across the paths of (charged) particles with various masses, and an electrical detector behind it records the intensity distribution of the masses". An optical spectrometer is defined as "an optical spectroscope that is provided with a calibrated scale either for the measurement of

wavelength or for measurement of refractive indices of transparent prism materials". Thus, Spangler's "mass spectrometer 103" reference to Figure 39 is not a reference to an optical spectrometer (light emission characteristics) as set forth in the Examiner's remarks, but is a reference to ion charge characteristics detected at the Faraday plate of a mass spectrometer.

Mass spectrometry, or Ion Mobility Spectrometry (IMS), requires a time-based drift ionic separation process before detection. Optical (photon) spectrometry does not require time-based separation of the generated photons (light emission), but analyzes the emissions simultaneously through a dispersion method like a prism.

The "ionic trap" taught in Spangler is an apparatus for storing ions by applying an electric field gradient to ions formed from an ultra-violet flashlamp, or similar means, acting on a gaseous sample. The tube taught by Spangler is a "drift tube" that allows the mobile ions to separate based on charge strength prior to detection at the Faraday plate; the separation time is assisted by the disclosed ion trap. Whereas, the electrically insulated hollow tube used in the presently claimed invention is a plasma chamber, designed to provide a proper environment for creating a low-power, atmospheric pressure plasma.

The presently claimed invention uses a high voltage source to create an atmospheric pressure plasma between two electrodes that in turn disassociates and excites the species within the sample gas, which in turn give off light photons in the subsequent decay process that are detected by an optical (photon) spectrometer. Spangler teaches the use of the high voltage source to create an electric field gradient between two electrodes that "traps" or slows down the generated ions for efficient detection through mass spectrometry.

Consequently, Spangler does not disclose each and every limitation, and as such, Spangler does not anticipate these claims under §102(b) because the definition of anticipation is not met. Withdrawal of this rejection is respectfully requested.

"Claims 5, 7-10, 12, 18, 20-23, 25, 33, 35-39, 43, and 44 are rejected under 35 USC 103(a) as being unpatentable over Spangler (US6124592). Spangler discloses the claimed invention except for the specific range of values determined. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have the voltage applied as claimed in order [to] enable an accurate emission detection, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. In re Aller, 105 USPQ 233."

The Applicant respectfully traverses this rejection. As denoted above, the invention taught in Spangler is an "ionic trap" for mass spectrometry where the voltage source applied is provided as a means to store the ions for more efficient detection by a Faraday plate. Spangler does not teach or suggest identification of light emission (light photons) characteristics of a specific ionic or molecular group. The presently claimed invention is a low power, atmospheric pressure plasma that uses the high voltage source to create the plasma that disassociates sample gases for optical (photo) excitation and de-excitation process in spectrometry. The voltage ranges are provided to teach optimal voltage requirements for creation of a stable atmospheric pressure plasma for optical (photo) spectrometry.

"If an independent claim is nonobvious under 35 USC 103, then any claim depending therefrom is nonobvious". MPEP §2143 citing *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988). The difference in definition between mass spectrometry and optical spectrometry makes the presently claimed invention nonobvious over Spangler. Withdrawal of this rejection is respectfully requested.

"**Claims 10, 23, 38, and 47 are rejected under 35 USC 103(a) as being unpatentable over Spangler (US6124592). Spangler discloses the claimed invention except for the tube being plastic. It would have been obvious to one having ordinary skill in the art at the time the invention was made to make the tube from plastic in order [to] enable accurate emission detection, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. In re Leshin, 125 USPQ 416.**"

The Applicant respectfully traverses this rejection. As disclosed above, the present invention comprises a low power, atmospheric plasma used to disassociate and excite a sample for optical (photon) spectrometry. The novelty of using a plastic tube is made possible by the stable, low power, low energy characteristics of the formed plasma. Historical plasma chambers have been constructed of aluminum oxide or ceramic materials, as the chambers were required to withstand higher energy plasmas. Spangler teaches a "drift tube" that allows the mobile ions to separate based on charge to mass ratio prior to detection at the Faraday plate; the separation time and signal intensity are assisted by the disclosed ion trap. Spangler's invention of an ion trap is designed to increase the detection efficiency of mass spectrometers and ion mobility spectrometers. Whereas, the present invention is designed to create a stable atmospheric pressure plasma for optical (photo) emission spectrometry.

"If an independent claim is nonobvious under 35 USC 103, then any claim depending therefrom is nonobvious". MPEP §2143 citing *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988). The difference in definition between mass spectrometry and optical spectrometry makes the presently claimed invention nonobvious over Spangler. Withdrawal of this rejection is respectfully requested.

"Claims 5, 12, 18, 25, 33, 39, 43, 49 are rejected under 35 USC 103(a) as being unpatentable over Spangler in view of Pulsed Discharge Helium Ionization Detector (Wentworth et al Chromatographia Vol 34, No. 5-8, September/ October 1992). Spangler discloses the claimed invention as noted above. However, Spangler does not disclose the gas is helium, or a window at one end of the tube. Pulsed Discharge Helium Ionization Detector teaches that helium should be used as the gas and also teaches that a window should be placed at one end of the tube in order to enable accurate emission detection. Therefore it would have been obvious to a person of ordinary skill in the art at the time the invention was made to have the gas of Spangler be helium and to place a window at one end of the tube of Spangler as suggested by Pulsed Discharge Helium Ionization Detector because it would ensure accurate emission detection."

The Applicant respectfully traverses this rejection. As noted above, mass spectrometry requires that ions travel to a Faraday plate for detection, thus placing a window at the end of the tube disclosed in Spangler would prevent the ions from collecting on the Faraday plate. Whereas, in the presently claimed invention, photons given off by the excited sample species will travel through a window to an optical (photon) spectrometer for analysis.

The use of helium as a preferred support gas in a plasma is well known in the art. The dependent claims to the novel, independent claims are provided to denote those various support gases, including helium, argon, nitrogen, and air, that enable the claimed low power, atmospheric plasma apparatus to provide excitation energy to a sample for optical (photon) emission spectrometry.

"If an independent claim is nonobvious under 35 USC 103, then any claim depending therefrom is nonobvious". MPEP §2143 citing *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988). The difference in definition between mass spectrometry and optical spectrometry makes the presently claimed invention nonobvious over Spangler in view of Wentworth et al. Withdrawal of this rejection is respectfully requested

The examiner is requested to allow claims 1-50 and to pass this case to issue.

Applicant's representative attorney would be pleased to further discuss this matter by telephone with the examiner if the examiner concludes such a discussion would assist in moving this case to issue.

Respectfully submitted,

Date: 9/30/03

Signature of Representative Attorney

Reg. No. 48,300
Phone: (505) 665-5187

Mark N. Fitzgerald
Los Alamos National Laboratory
LC/IP, MS A187
Los Alamos, New Mexico 87544